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FUNDAMENTAL ATOM CHEMISTRY WITH APPLICATIONS TO THE CHEMISTRY OF THE UPPER ATMOSPHERE

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UNPUBLISHED PRELIMINARY DATA

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P. Harteck
R. R. Reeves, Jr. and E.W. Albers [1963] 2p 0 refs

As mentioned in the previous report the conversion data of tritium in the solid phase at 4.2°K and the conversion studies made at 27.2°K were submitted for publication in June 1963. [redacted]

Investigation of the nitrogen system has continued using N_2^{14-14} and N_2^{15-15} under various conditions, but principally dictated by the knowledge gained from the tritium experiments. To date a small effect has been observed in the conversion of the nitrogen system at ~1.5°K. From a continuing knowledge gained from the tritium experiments enhancement of this conversion appears likely.

The conversion of tritium in the heat conductivity cell now appears to occur exclusively via a wall catalysis; increasing the wall surface by a factor five resulted in a five-fold increase in the conversion rate. Although conversion in the gas phase undoubtedly still occurs, the contribution to the observed rate is negligible.

The half-lifetime for the conversion in the solid phase with varying amounts of hydrogen present (5% - 50% hydrogen) varies linearly with the hydrogen content. Recently, the conversion of both isotopes in the solid phase has been measured simultaneously. Whereas the tritium half-lifetime increases with increasing amounts of hydrogen, the hydrogen half-lifetime decreases substantially.

Future Work

The role of ions in the solid phase conversion of tritium and tritium hydrogen mixtures still remains uncertain. Currently, a 10% tritium in hydrogen mixture is under investigation. If the rate of conversion of hydrogen increases substantially in the solid phase with 10% tritium present the conversion then is proceeding almost exclusively by an ion mechanism.

The problem of water vapor is being considered in connection with the noctilucent clouds as detailed by Dr. Hemenway of the Dudley observatory.